City of Salina Raw Water Supply Study

Citizen's Advisory Board Workshop

April 16, 2009
6:00 PM

Introductions

- City Staff
  - Martha Tasker, Director of Utilities
  - Kurt Williams, Plant Operations Manager
  - Jeff Cart, Utilities Supervisor
  - Steve Palmer, Utility Engineer
- Consultants
  - HDR
    - Donald Lindeman, Project Manager
    - Lorrie Hill, Project Engineer
  - Layne Christensen
    - Luca DeAngelis Hydrogeologist

Questions?
Contact: **Martha Tasker**
Phone: **785-309-5725**
E-Mail: **martha.tasker@salina.org**

Introductions

- Citizens Advisory Board Members

Dan Ade
Gina Bell
Robert Bostater
Beth Eisenbraun
Tim Hobson
Mike Hulteen
James Maes
Charles May
John Ourada
Lawrence Wetter

Raw Water Supply Study

- Purpose of Study
  - Recent drought conditions
  - Contamination issues near wellfields
  - Strained ability of City to maintain adequate water supply for customers
  - Identify sustainable solutions for next 50 years
  - Diversify water supply sources
- CAB meetings at key project milestones
  - August, 2008 - Demand projections, water rights
  - November, 2008 – Future regulatory impacts, existing facilities
  - December, 2008 - Conservation, reuse
  - January, 2009 – New Sources of Supply
  - February, 2009 – Alternatives
  - March, 2009 – Emergency Water Supply Plan
  - April, 2009 – Draft Report

Agenda for Tonight

- Review of Study Objectives
  - Purpose of Citizens Advisory Board
  - Scope of the Raw Water Supply Study
- Review Alternatives Selected for Final Evaluation
- Results of Paired Comparison Matrix
- Results of Final Alternatives Evaluation
- Capital Improvements Plan

Review of Alternatives Selected for Final Evaluation

Preliminary Screening Results

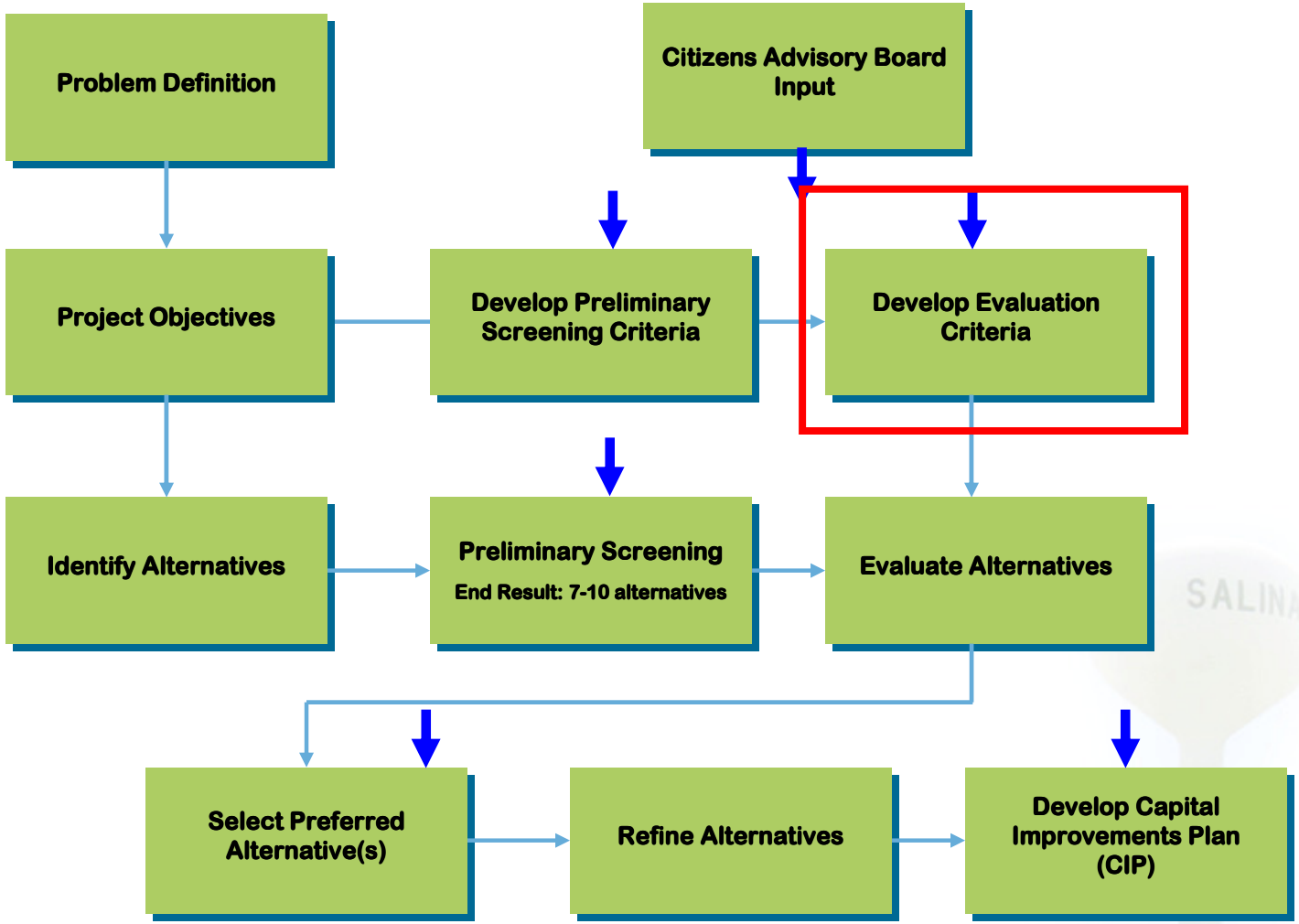
Alternatives	Preliminary Screening Criteria - # Passing					Total # Passing Criteria
	Optimizes Existing Resources	Increases Reliability during Drought Periods	Minimizes Implementation Risk	Expandable for Future Demands	Cost Effective (above natural breakpoint)	
Improvements at South Wellfield	4				1	5
Obtain a seasonal surface water right	3.5				1	4.5
Improvements at Downtown Wellfield	2.5				1	3.5
Confluence of Smoky Hill and Solomon Rivers	2.5				1	3.5
Acquisition of existing water rights	2.5				1	3.5
Water reuse	2.5				1	3.5
Milford Reservoir	2				1	3
Dakota Aquifer	2				1	3
Saline River	1.5				1	2.5
Develop a water assurance district	1.5				1	2.5
Aquifer recharge	1				1	2
Kanopolis Reservoir	0.5				1	1.5
Construct a water supply reservoir	1.5				0	1.5
Wilson Reservoir	1				0	1

Preliminary Screening Results

- Conservation considered as a “side item”
- Water Assurance District stays in plan but cannot depend on it for all of water supply
- Acquisition of existing water rights always an option

Results of Paired Comparison Matrix

Alternatives Process



Pair Matrix Survey Results

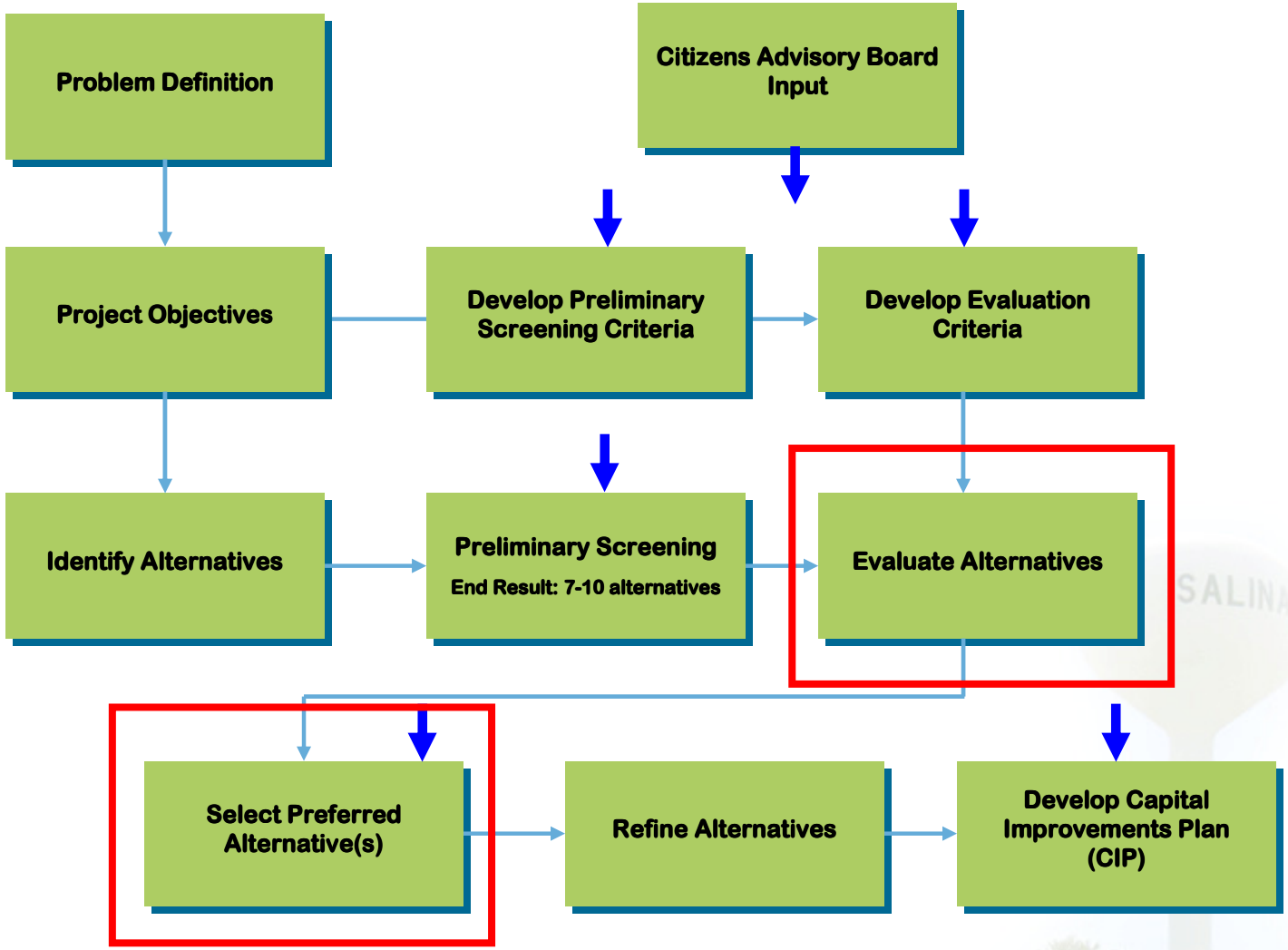
Evaluation Criteria	1 Optimizes existing infrastructure	2 Increases reliability during drought	3 Minimizes implementation risk	4 Expandable for future demands	5 Cost Effective	6 Implementation Time	7 Minimizes environmental impacts	8 Desirable water quality	9 Permitability	10 Sustainability	How many times did CAB select:
1 Optimizes existing infrastructure		1 vs 2	1 vs 3	1 vs 4	1 vs 5	1 vs 6	1 vs 7	1 vs 8	1 vs 9	1 vs 10	**1 - 42**
2 Increases reliability during drought			2 vs 3	2 vs 4	2 vs 5	2 vs 6	2 vs 7	2 vs 8	2 vs 9	2 vs 10	**2 - 63**
3 Minimizes implementation risk				3 vs 4	3 vs 5	3 vs 6	3 vs 7	3 vs 8	3 vs 9	3 vs 10	**3 - 25**
4 Expandable for future demands					4 vs 5	4 vs 6	4 vs 7	4 vs 8	4 vs 9	4 vs 10	**4 - 54**
5 Cost effective						5 vs 6	5 vs 7	5 vs 8	5 vs 9	5 vs 10	**5 - 54**
6 Implementation Time							6 vs 7	6 vs 8	6 vs 9	6 vs 10	**6 - 20**
7 Minimizes environmental impacts								7 vs 8	7 vs 9	7 vs 10	**7 - 25**
8 Desirable water quality									8 vs 9	8 vs 10	**8 - 49**
9 Permitability										9 vs 10	**9 - 41**
10 Sustainability											**10 - 65**

Pair Matrix Survey Results

Evaluation Criteria	How many times did you select:	Weighting Factor
Sustainability	10 - 65	14.8%
Increases reliability during drought	2 - 63	14.4%
Expandable for future demands	4 - 54	12.3%
Cost effective	5 - 54	12.3%
Desirable water quality	8 - 49	11.2%
Optimizes existing infrastructure	1 - 42	9.6%
Permitability	9 - 41	9.4%
Minimizes implementation risk	3 - 25	5.7%
Minimizes environmental impacts	7 - 25	5.7%
Implementation Time	6 - 20	4.6%

Results of Final Alternatives Evaluation

Alternatives Process



Alternative Evaluation

- Used CAB weighting factors from paired matrix worksheet summary
- Used Basic Evaluation Criteria
- Each category had a separate discussion
- Each project given a 1, 2 or 3 rating for each criterion

Alternative Evaluation Handout

Alternative Evaluation Criteria

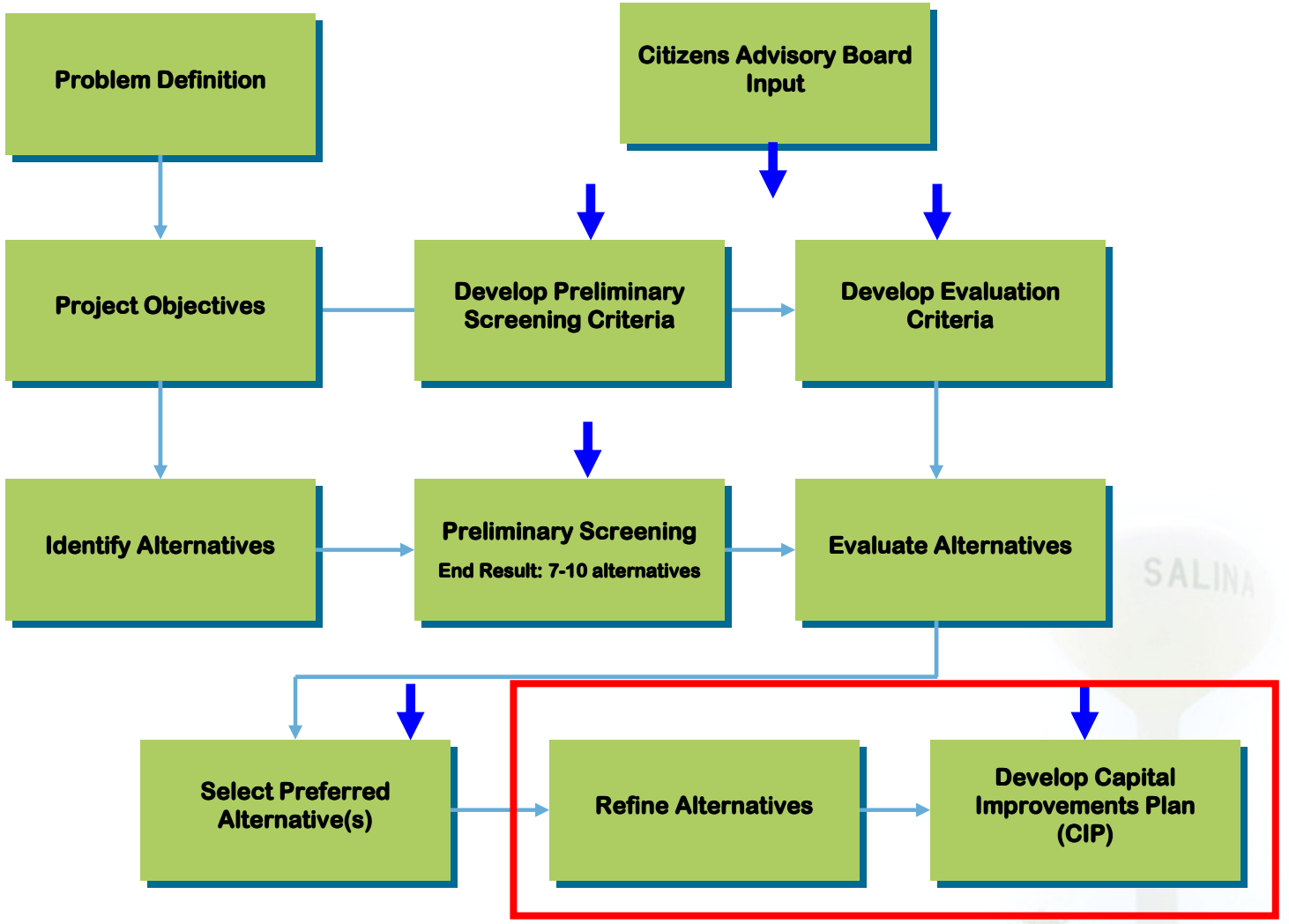
1. **Optimizes Existing Resources**
   - High – 3 Points
     - ✓ The alternative utilizes or makes more effective all of the following: existing water rights, water sources, and infrastructure.
   - Moderate – 2 Points
     - ✓ The alternative utilizes or makes more effective one of the following: existing water rights, water sources, or infrastructure.
   - Low – 1 Point
     - ✓ The alternative doesn't utilize any existing resources.
2. **Increases Reliability During Drought**
   - High – 3 Points
     - ✓ The alternative will most likely be available during drought and is a different water source than currently utilized.
   - Moderate – 2 Points
     - ✓ The alternative will most likely be available during drought but is from the same water source currently utilized.
   - Low – 1 Point
     - ✓ The alternative most likely will not be available during drought.
3. **Minimizes Implementation Risk (includes public acceptance)**
   - High – 3 Points
     - ✓ There are no risks involved with implementing this alternative. Public acceptance will not be an issue.
   - Moderate – 2 Points
     - ✓ There is only maybe one risk involved with implementing this alternative but most likely this is a minor risk and can be easily mitigated. Public acceptance will not be an issue.
   - Low – 1 Point
     - ✓ There is one major or more than one minor risk involved with implementing this alternative that may not be easily mitigated. Public acceptance could be an issue.
4. **Expandable for Future Demand**
   - High – 3 Points
     - ✓ The alternative is easily expandable for future demand and there is adequate water available for future demand.
   - Moderate – 2 Points
     - ✓ The alternative is expandable for future demand and there is limited water available for future demand.
   - Low – 1 Point
     - ✓ The alternative is not expandable for future demand or there is not adequate water available for future demand.
5. **Cost Effective**
   - High – 3 Points
     - ✓ The alternative has low capital and O&M costs (compared to the other alternatives). It is in the range of up to $5/gallon.
   - Moderate – 2 Points
     - ✓ The alternative has moderate capital and O&M costs (compared to the other alternatives). It is in the range of $5/gallon to $10/gallon.
   - Low – 1 Point
     - ✓ The alternative has high capital and O&M costs (compared to the other alternatives). It is higher than $10/gallon.
6. **Time to Implement**
   - High – 3 Points
     - ✓ The time to design, permit, and construct this alternative is most likely up to a 3 year process.
   - Moderate – 2 Points
     - ✓ The time to design, permit, and construct this alternative is most likely a 3-6 year process
   - Low – 1 Point
     - ✓ The time to design, permit, and construct this alternative is most likely longer than a 6 year process.
7. **Minimizes Environmental Impacts**
   - High – 3 Points
     - ✓ The alternative avoids or minimizes all potential environmental impacts. All environmental impacts can be easily mitigated.
   - Moderate – 2 Points
     - ✓ The alternative avoids or minimizes most potential environmental impacts. Most of the environmental impacts can be mitigated.
   - Low – 1 Point
     - ✓ The alternative will have a negative environmental impact that cannot be mitigated.
8. **Desirable Water Quality**
   - High – 3 Points
     - ✓ The alternative will require no additional water treatment above what is currently provided at the existing water treatment facility.
   - Moderate – 2 Points
     - ✓ The alternative will require additional conventional water treatment processes (i.e. softening or iron & manganese removal, etc.).
   - Low – 1 Point
     - ✓ The alternative will require additional advanced water treatment process (i.e. reverse osmosis, ozone, etc.).
9. **Permitability**
   - High – 3 Points
     - ✓ The alternative will require minor additional permitting/approval process (KDHE approval of plans and specifications is not included.
   - Moderate – 2 Points
     - ✓ The alternative will require a number of minor permits that are normal in Kansas (i.e. water right acquisition, facility permitting, pilot testing, etc.).
   - Low – 1 Point
     - ✓ The alternative will require major permitting/approval process (i.e. injection well, inter-basin transfer, etc.).
10. **Sustainability**
    - High – 3 Points
      - ✓ The alternative will have the ability to optimize its benefits without diminishing the capacity for similar benefits in the future (i.e. the alternative will be able to supply water in 50 years.)
    - Moderate – 2 Points
      - ✓ The alternative may have the ability to optimize its benefits without diminishing the capacity for similar benefits in the future (i.e. the alternative may be able to supply water in 50 years.)
    - Low – 1 Point
      - ✓ The alternative will not have the ability to optimize its benefits without diminishing the capacity for similar benefits in the future (i.e. the alternative will not be able to supply water in 50 years.)

Alternatives Evaluation

	Evaluation Criteria										Total Points
	Optimizes Existing Infrastructure	Increases Reliability during Droughts	Minimizes Implementation Risk	Expandable for Future Demands	Cost Effective	Implementation Time	Minimizes Environmental Impacts	Desirable Water Quality	Permitability	Sustainability	
Improvements at South Wellfield	3 X 9.6	3 X 14.4	3 X 5.7	2 X 12.3	3 X 12.3	3 X 4.6	3 X 5.7	2 X 11.2	2 X 9.4	3 X 14.8	**267**
Improvements at Downtown Wellfield	3 X 9.6	2 X 14.4	3 X 5.7	1 X 12.3	3 X 12.3	3 X 4.6	3 X 5.7	3 X 11.2	3 X 9.4	3 X 14.8	**261**
Obtain a Seasonal Surface Water Right	2 X 9.6	1 X 14.4	3 X 5.7	3 X 12.3	3 X 12.3	3 X 4.6	2 X 5.7	3 X 11.2	3 X 9.4	2 X 14.8	**241**
Confluence of Smoky Hill and Solomon Rivers	1 X 9.6	3 X 14.4	2 X 5.7	3 X 12.3	2 X 12.3	2 X 4.6	2 X 5.7	1 X 11.2	2 X 9.4	3 X 14.8	**221**
Dakota Aquifer	1 X 9.6	3 X 14.4	2 X 5.7	2 X 12.3	2 X 12.3	2 X 4.6	2 X 5.7	3 X 11.2	2 X 9.4	2 X 14.8	**216**
Milford Reservoir	1 X 9.6	3 X 14.4	1 X 5.7	2 X 12.3	2 X 12.3	1 X 4.6	2 X 5.7	3 X 11.2	1 X 9.4	3 X 14.8	**211**
Water Reuse - Alt 3	2 X 9.6	2 X 14.4	2 X 5.7	2 X 12.3	1 X 12.3	3 X 4.6	2 X 5.7	2 X 11.2	2 X 9.4	3 X 14.8	**207**
Water Reuse - Alt 1	2 X 9.6	2 X 14.4	1 X 5.7	2 X 12.3	1 X 12.3	2 X 4.6	2 X 5.7	2 X 11.2	2 X 9.4	3 X 14.8	**197**
Water Reuse - Alt 2	2 X 9.6	2 X 14.4	1 X 5.7	2 X 12.3	1 X 12.3	2 X 4.6	2 X 5.7	2 X 11.2	2 X 9.4	3 X 14.8	**197**
Saline River	1 X 9.6	3 X 14.4	2 X 5.7	2 X 12.3	2 X 12.3	2 X 4.6	2 X 5.7	1 X 11.2	1 X 9.4	2 X 14.8	**184**

Refine Alternatives and Develop the Capital Improvements Plan

Alternatives Process



Problem

- Problem Definition
  - Decreased reliability of raw water supplies during drought conditions
  - Need water supplies to meet growing demands
  - Groundwater Contamination
- Project Objectives
  - Increase the reliability of raw water supplies, especially during drought conditions
  - Support economic growth and development
  - Optimize existing infrastructure where possible
  - Minimize risks to the City and its customers
  - Cost effective solutions – “most bang for the buck”

Problem – Demand Projections

Projected Demands					
Year	Average Day (MGD)	Summer Average Day (MGD)	Maximum Day (MGD)	Max Annual Quantity (ac-ft)	Avg Annual Quanitity (ac-ft)
2010	8.14	12.05	15.57	10,212	9,119
2015	8.38	12.40	16.03	10,511	9,386
2020	8.62	12.76	16.48	10,810	9,653
2025	8.85	13.11	16.94	11,109	9,920
2030	9.09	13.46	17.40	11,408	10,186
2035	9.33	13.81	17.85	11,707	10,453
2040	9.57	14.17	18.31	12,005	10,720
2045	9.81	14.52	18.76	12,304	10,987
2050	10.05	14.87	19.22	12,603	11,254
2055	10.28	15.23	19.67	12,902	11,521
2060	10.52	15.58	20.13	13,201	11,788

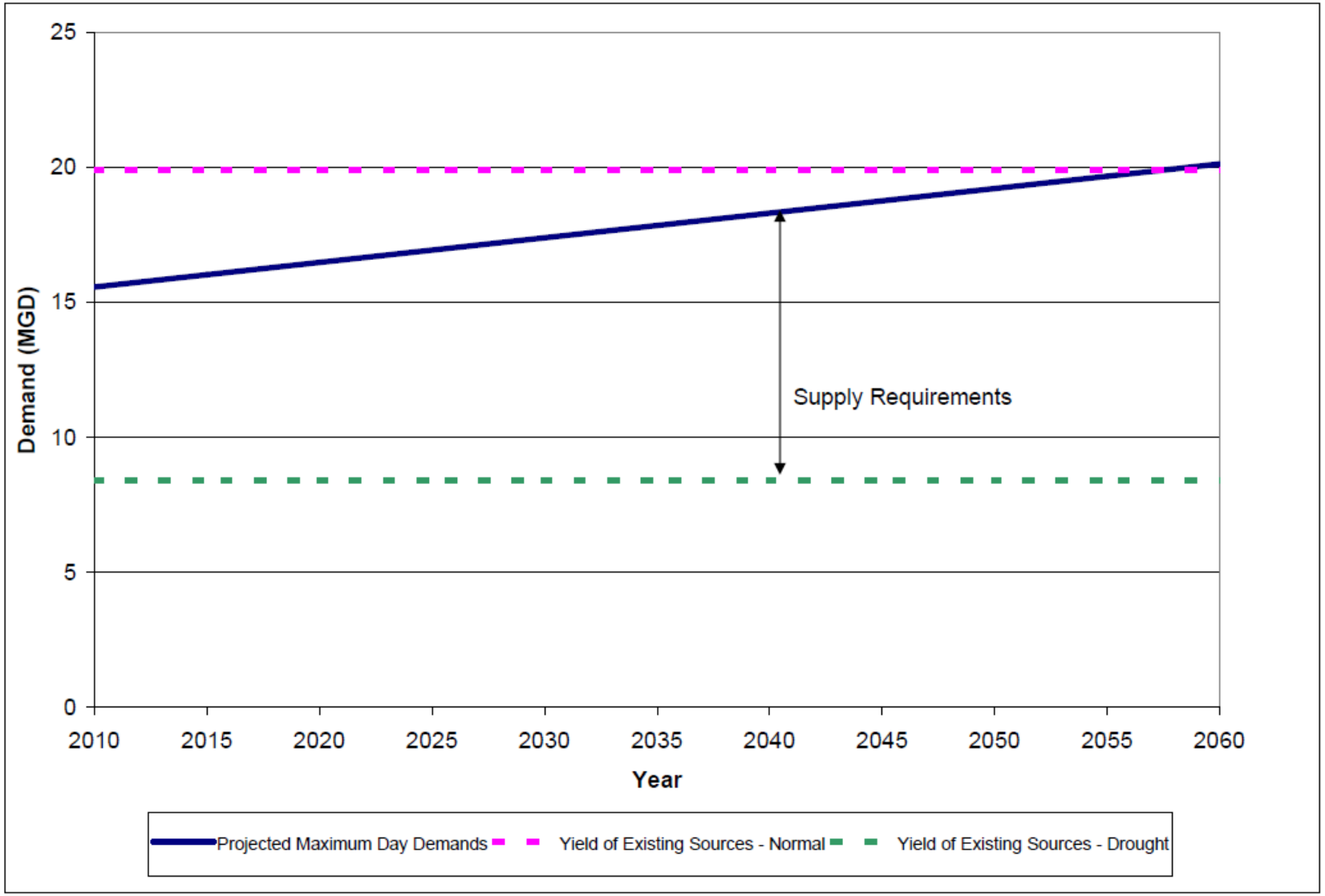
Problem – Supply Sources

Year	Existing Sources Yield Non-Drought			Existing Sources Yield Drought			Existing Sources Yield Annual		
	Smoky Hill River Yield (MGD)	Firm Capacity DT Wellfield Yield (MGD)	Total (MGD)	Smoky Hill River Yield (MGD)	DT Wellfield Yield (MGD)	Total (MGD)	Smoky Hill River Yield (ac-ft)	DT Wellfield Yield (ac-ft)	Total (ac-ft)
2010	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2015	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2020	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2025	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2030	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2035	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2040	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2045	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2050	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2055	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021
2060	10.00	9.90	19.90	0.00	8.40	8.40	5,028	4,993	10,021

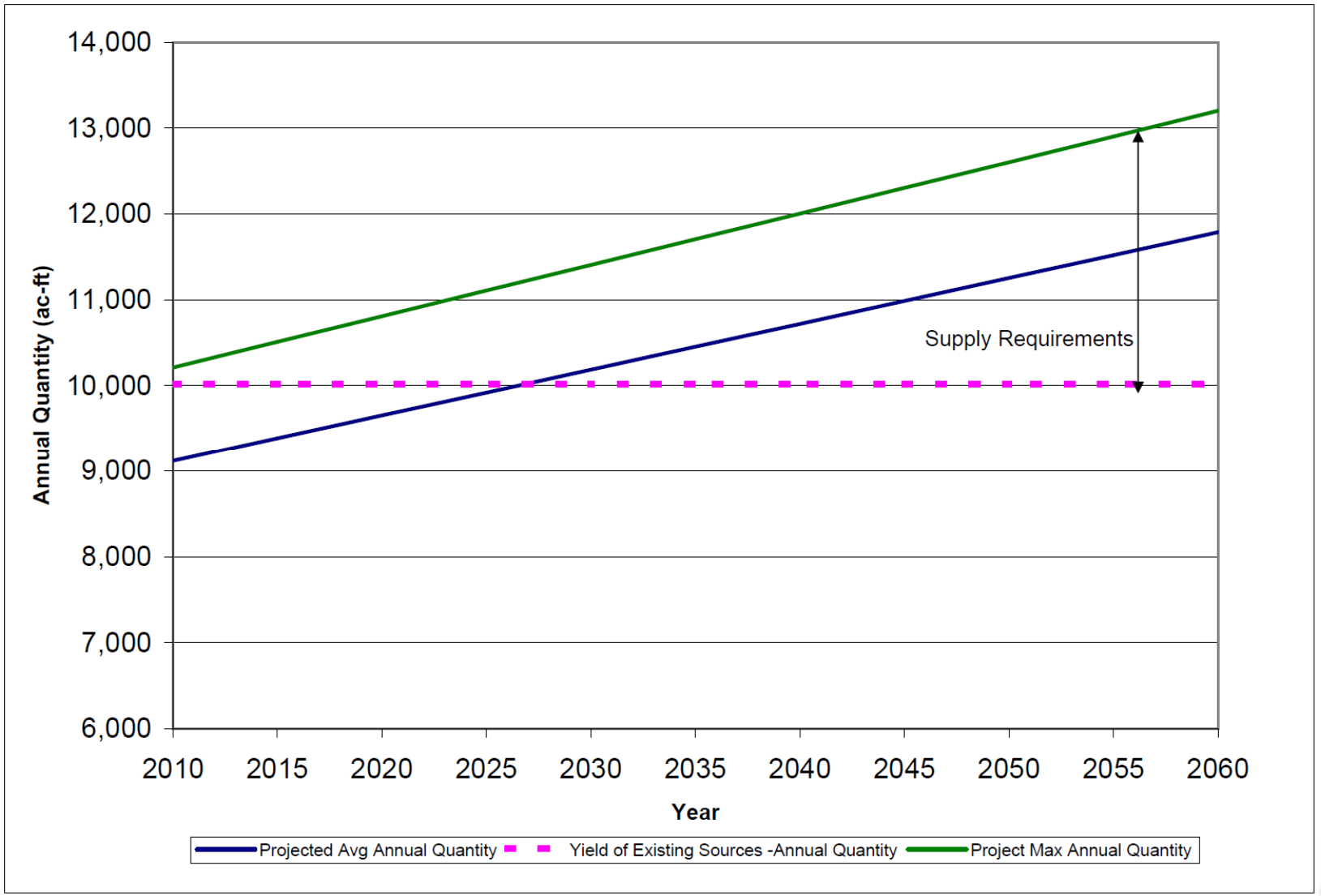
Problem – Supply Needs

Year	Supply Needs			
	Supply Needs Non-Drought (MGD) (1)	Supply Needs Drought (MGD) (2)	Supply Needs Avg Annual (ac-ft) (3)	Supply Needs Max Annual (ac-ft) (4)
2010	0.0	7.2	0	191
2015	0.0	7.6	0	490
2020	0.0	8.1	0	789
2025	0.0	8.5	0	1088
2030	0.0	9.0	165	1387
2035	0.0	9.5	432	1686
2040	0.0	9.9	699	1984
2045	0.0	10.4	966	2283
2050	0.0	10.8	1233	2582
2055	0.0	11.3	1500	2881
2060	0.2	11.7	1767	3180

Demand Deficit During a Drought



Annual Demand Deficit



Discussion/Questions

Supply Sources for Drought

- Drought supply needs
  - 9.0 MGD by 2030
  - 2.7 MGD additional by 2060

- Top – ranked supply sources
  1. South Wellfield Improvements
     - 3.7 – 7.5 MGD
  2. Downtown Wellfield Improvements
     - Conservatively an additional 4.6 MGD
  3. Seasonal Surface Water Right
     - 5.0 – 10.0 MGD
  4. Confluence of Smoky Hill and Solomon Rivers
     - 5.0 – 20.0 MGD
  5. Dakota Aquifer
     - 5.0 – 7.5 MGD

Supply Sources Engineering Considerations

1. South Wellfield Improvements
   - 3.7 MGD existing right
   - Potential for new water rights
   - Could acquire existing water rights
2. Downtown Wellfield Improvements
   - Conservatively an additional 4.6 MGD
   - Optimizes existing facilities
3. Seasonal Surface Water Right
   - Provides additional water during off season
   - During drought may not be available
4. Confluence of Smoky Hill and Solomon Rivers
   - Drought resistant supply
   - Volume of supply sufficient for needs
5. Dakota Aquifer
   - Drought resistant supply
   - Questionable yield of aquifer

Problem – Supply Needs

Year	Supply Needs			
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2030	0.0	9.0	165	1387
2035	0.0	9.5	432	1686
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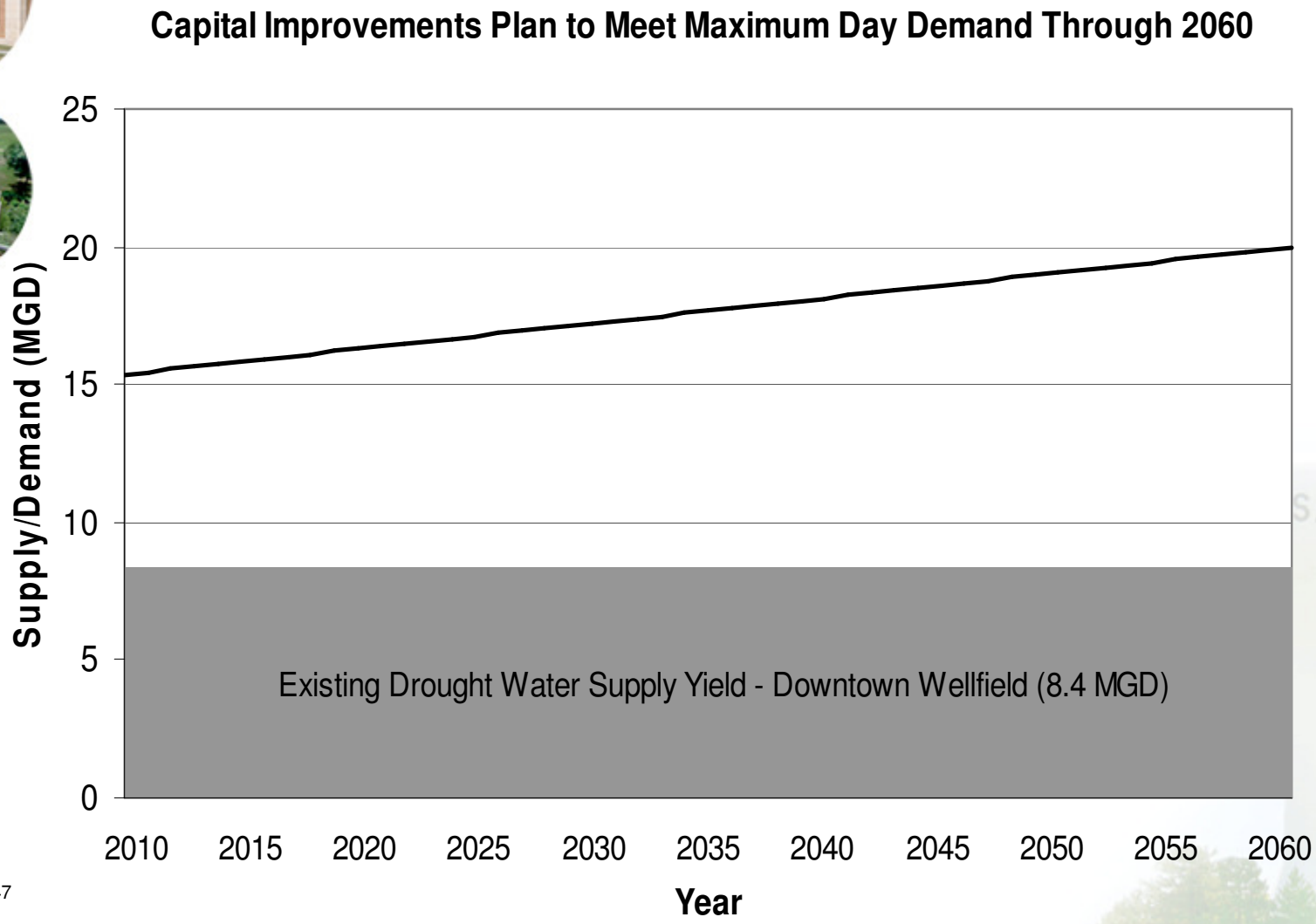
Additional Supply During a Drought



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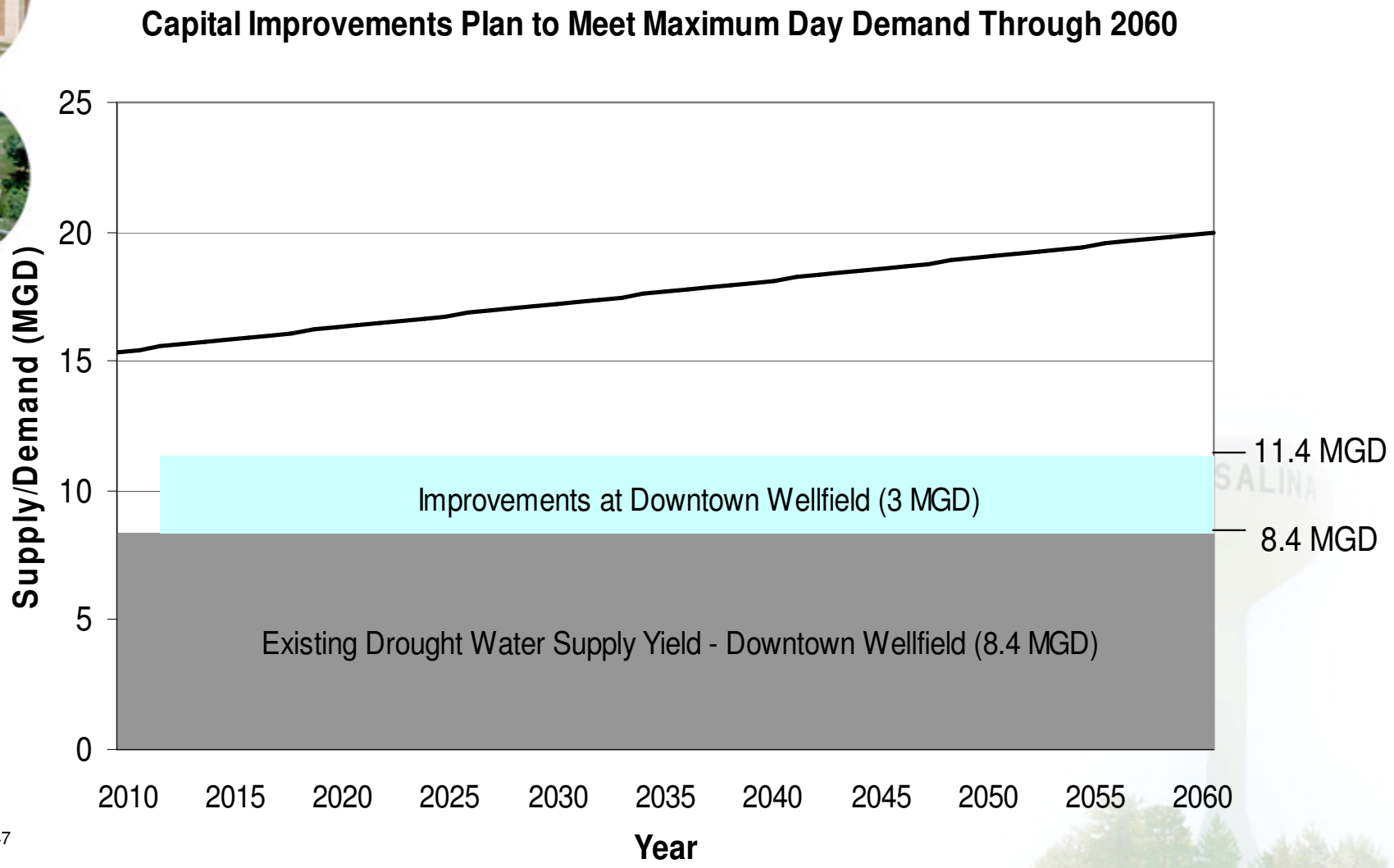

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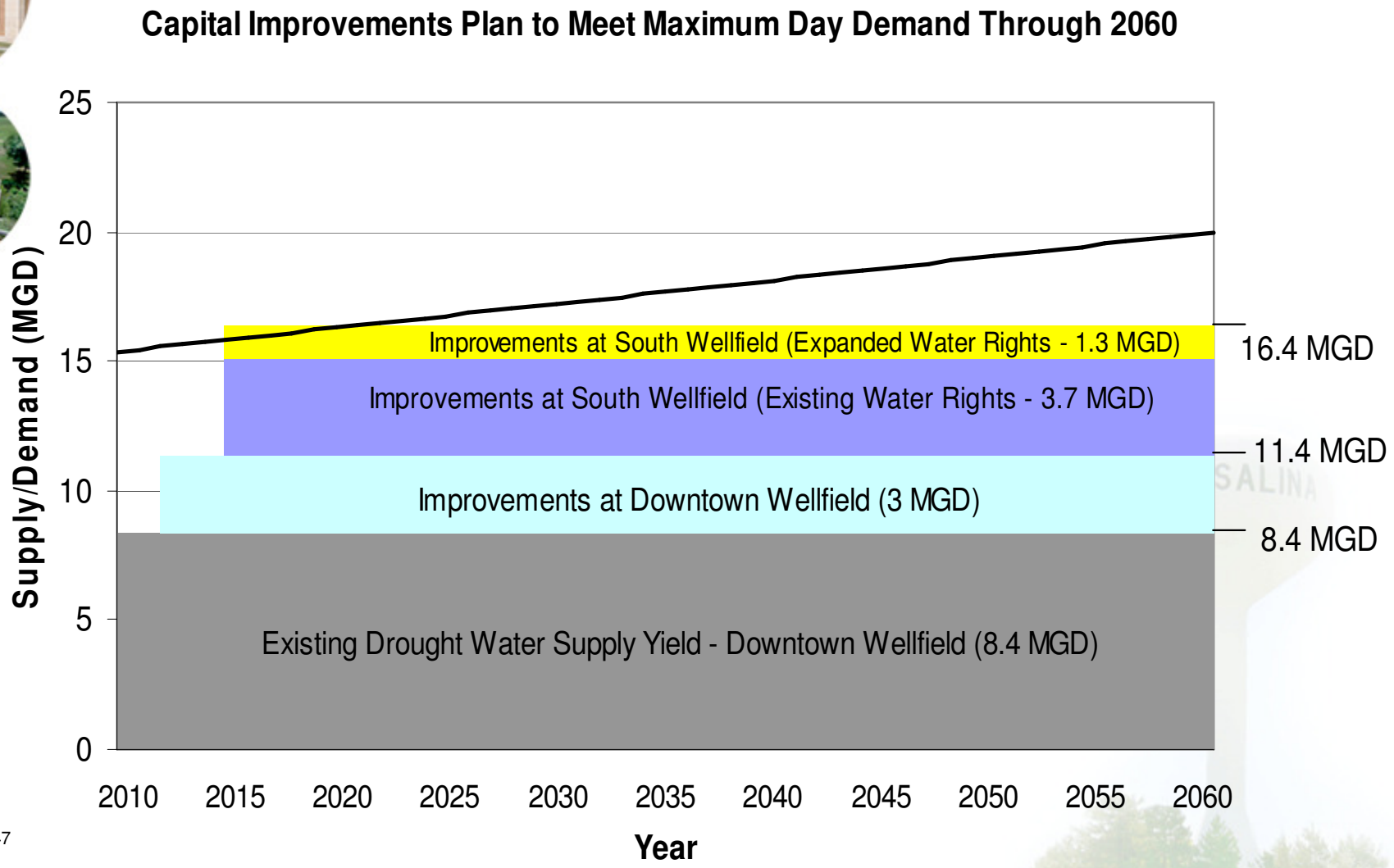
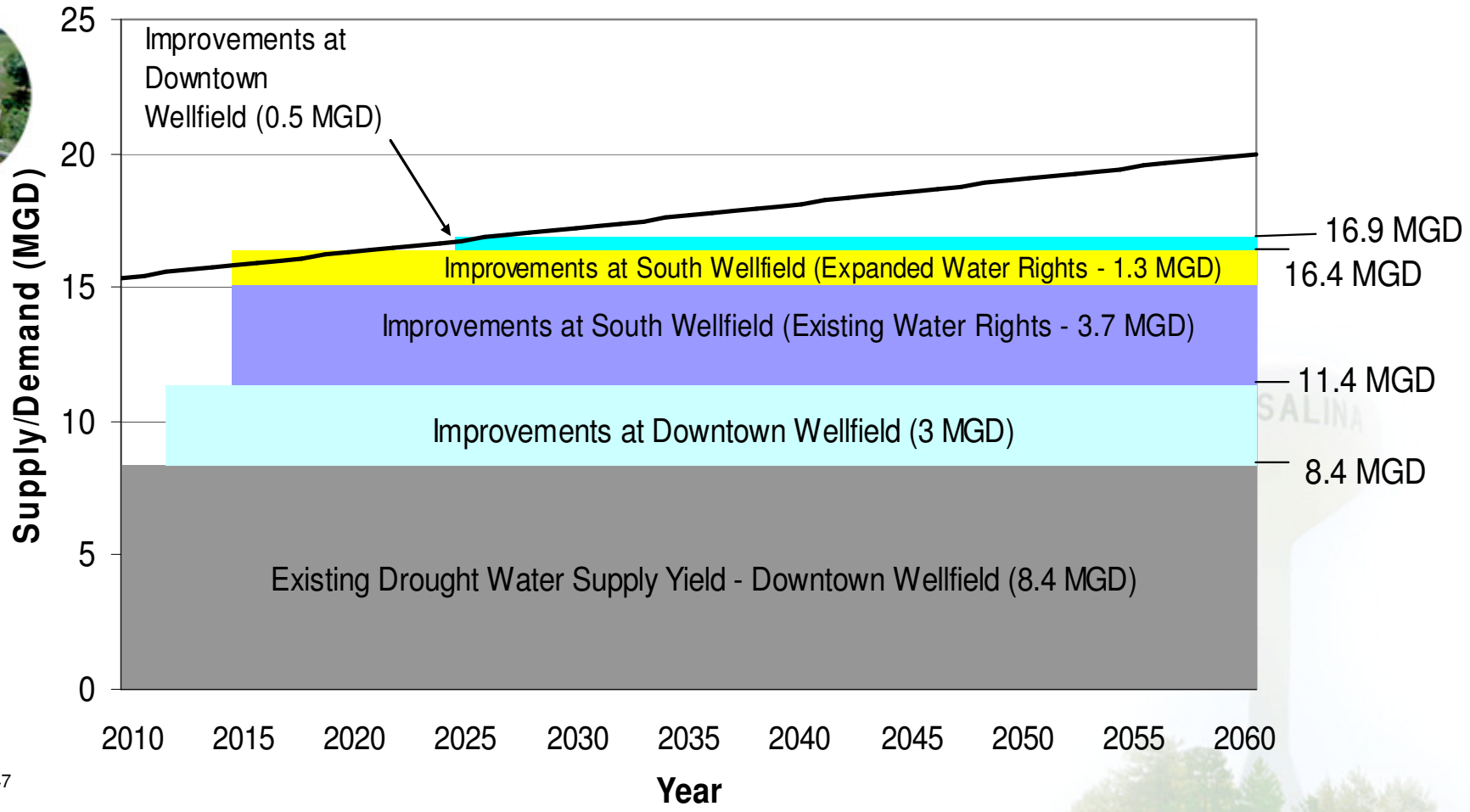


Additional Supply During a Drought

Capital Improvements Plan to Meet Maximum Day Demand Through 2060



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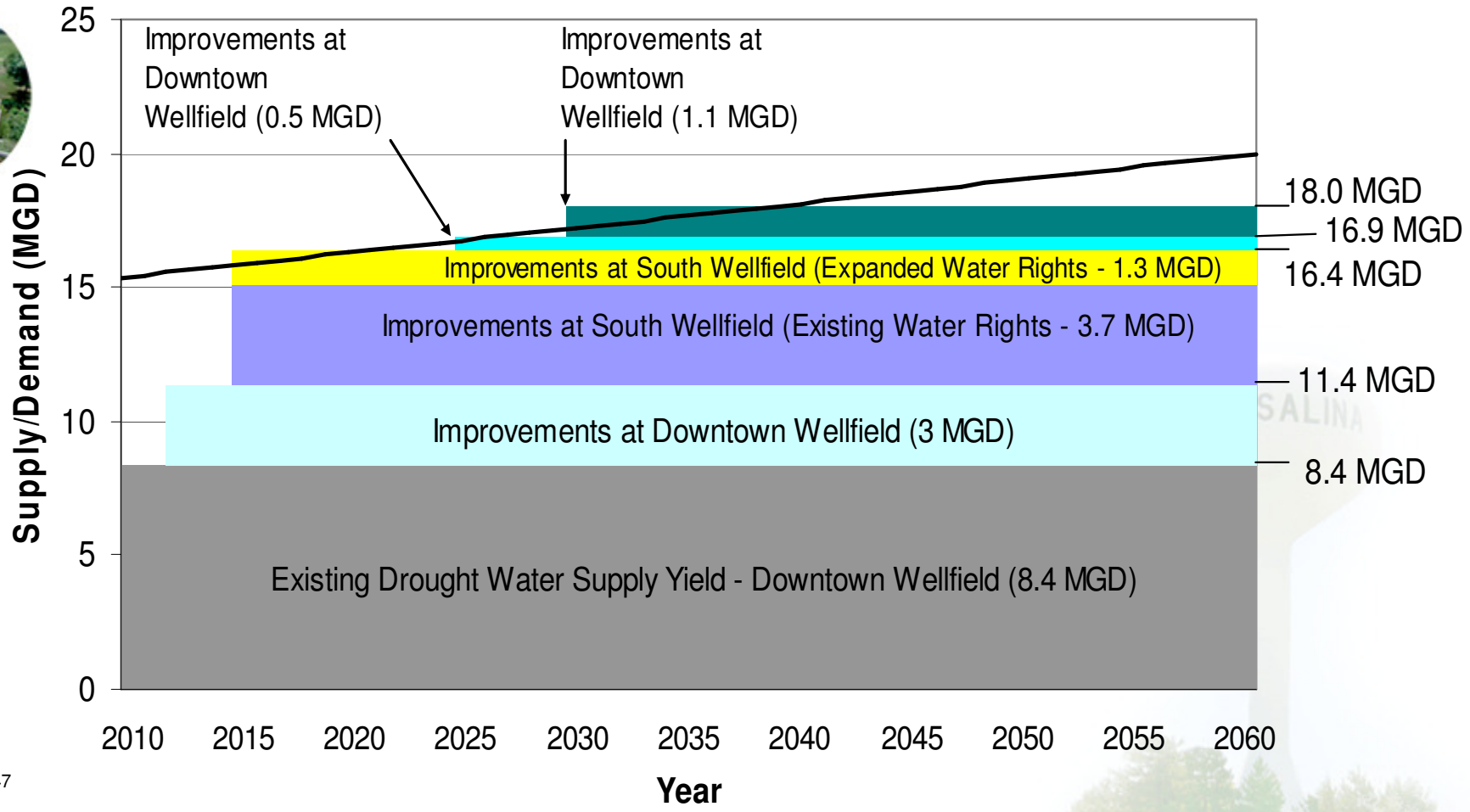

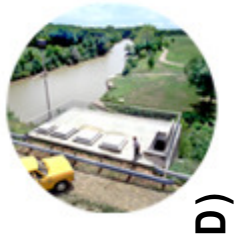

Additional Supply During a Drought

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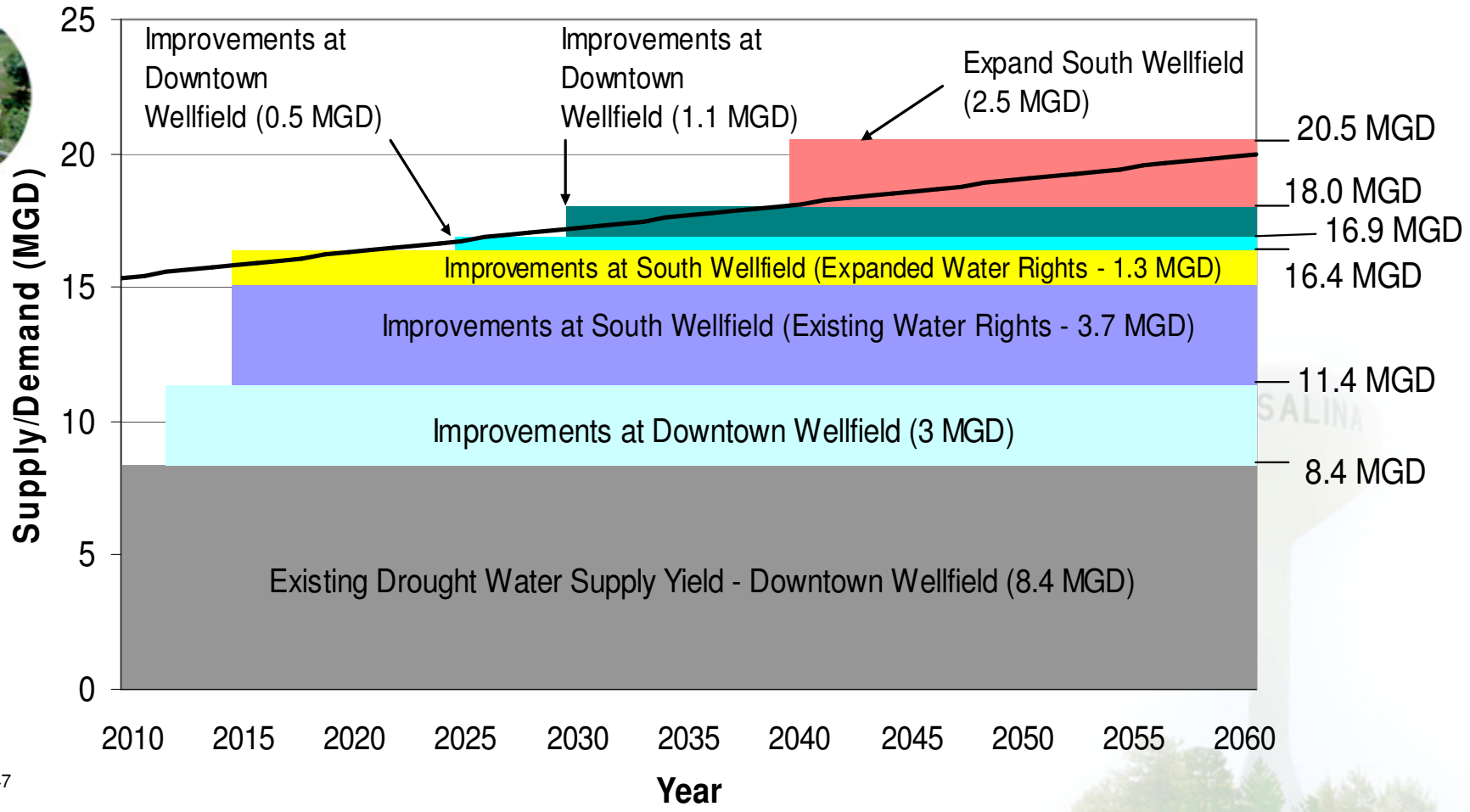

Discussion/Questions

Supply Sources Annual Quantity Engineering Considerations

1. South Wellfield Improvements
   - 3.7 MGD existing right
   - Potential for new water rights
   - Could acquire existing water rights
2. Downtown Wellfield Improvements
   - Conservatively an additional 4.6 MGD
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3. Seasonal Surface Water Right
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   - Drought resistant supply
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Problem – Supply Needs

Year	Supply Needs			
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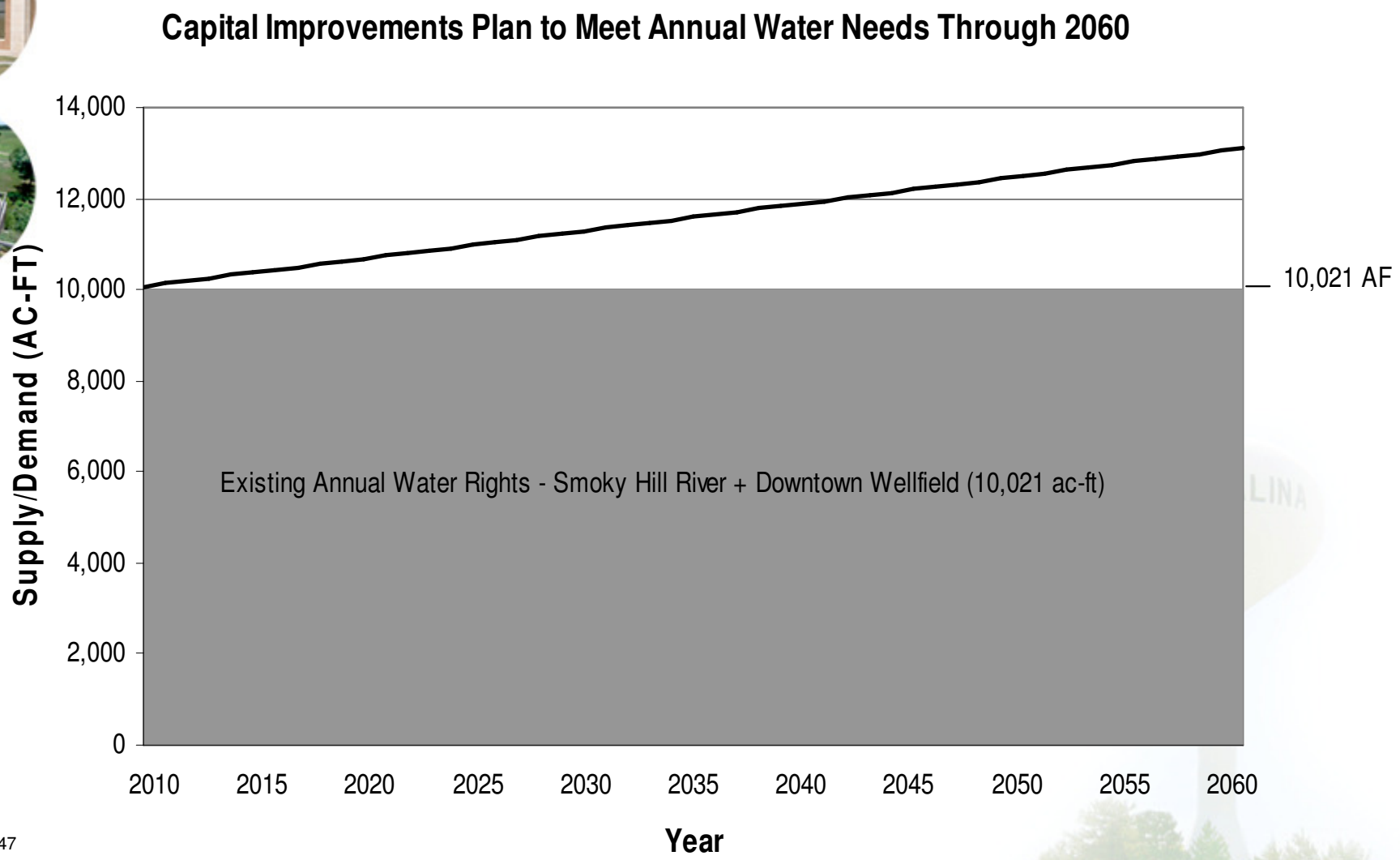
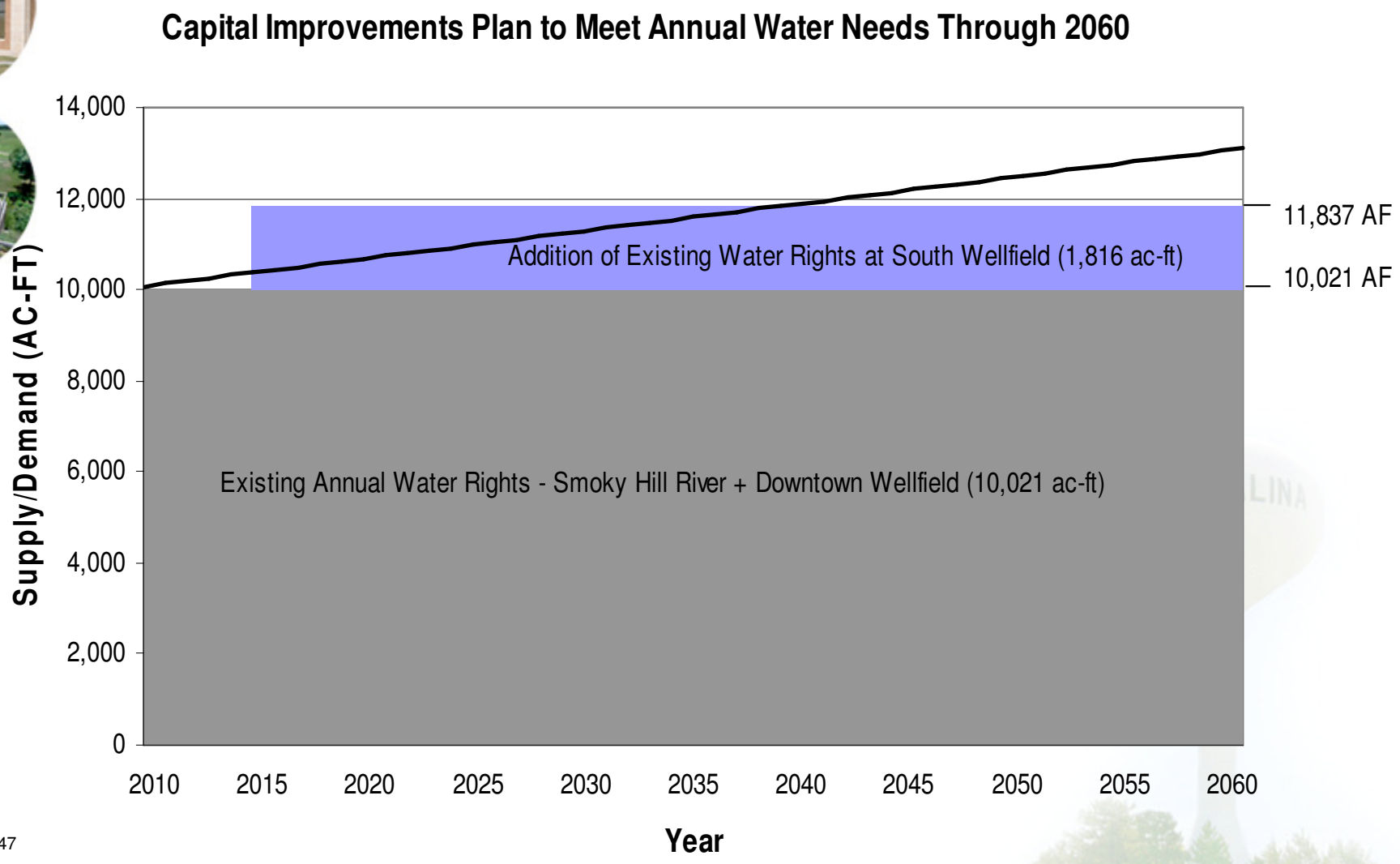
Additional Annual Quantity



Additional Annual Quantity



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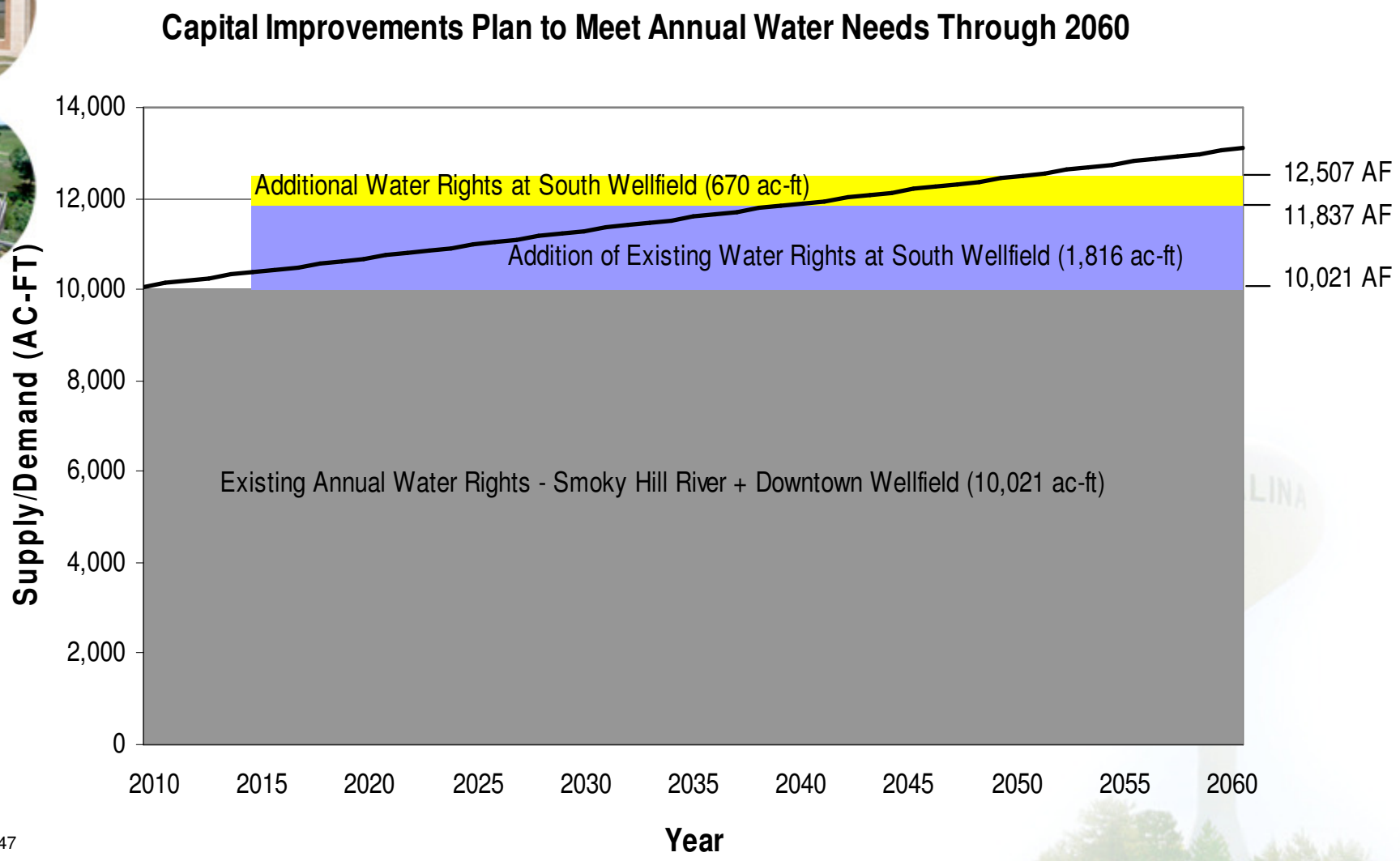
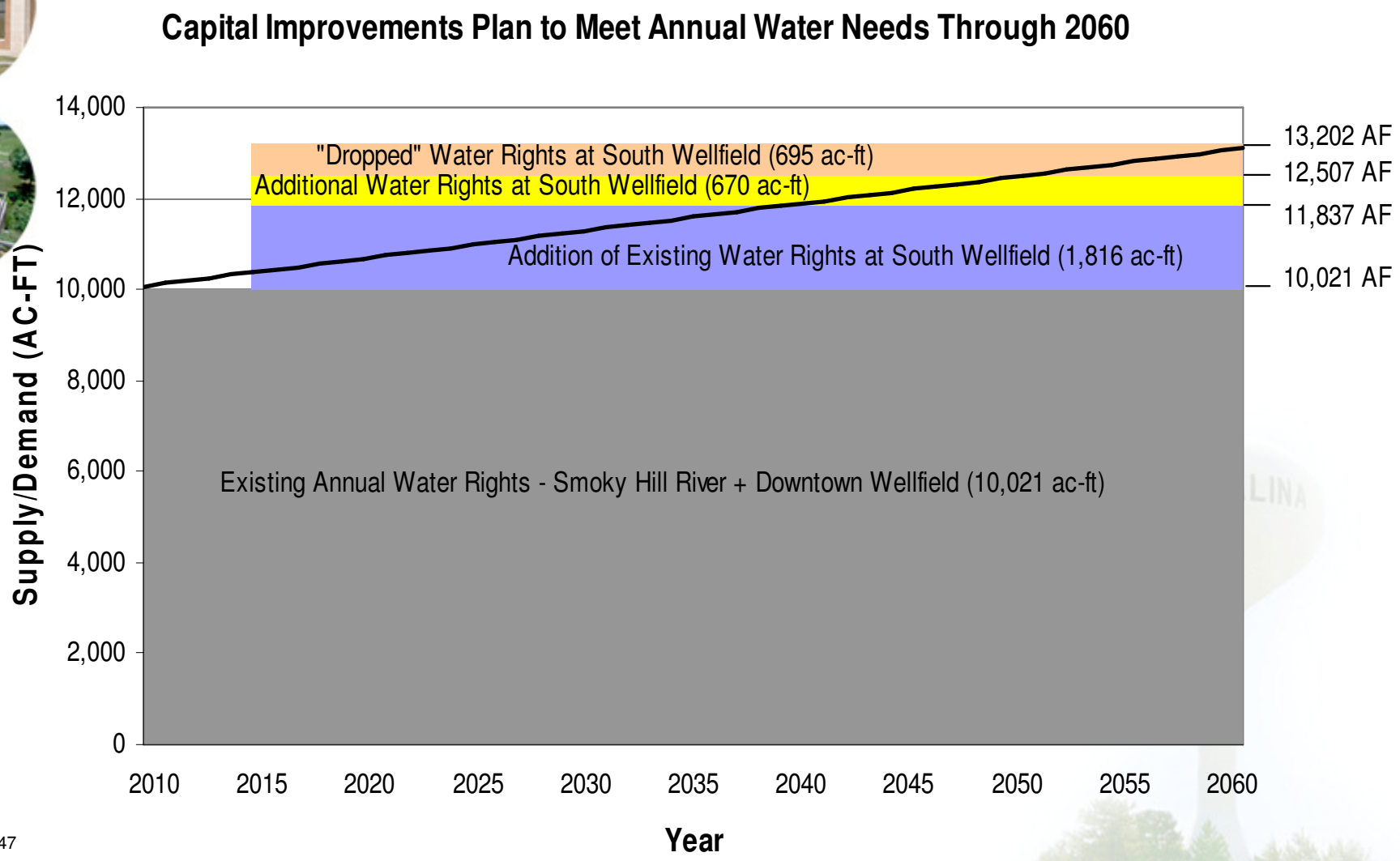


Additional Annual Quantity



Capital Improvement Plan Steps

<u>Phase I - bring online by 2012</u>

- Improvements at Downtown Wellfield for an additional 3 MGD
  - Re-drill 4 wells
- Wellfield piping improvements
- Retrofit of air stripping facilities at the existing water treatment plant

Be continually working with KDHE to mitigate Downtown Wellfield contamination impacts

Assume KDHE has mitigated Downtown Wellfield contamination impacts

Capital Improvement Plan Steps
(Continued)

Phase II - bring online by 2015

- Improvements at South Wellfield for an additional 5 MGD
  - Demolition of existing Schilling Water Treatment Plant
  - Addition of a 5 MGD groundwater treatment facility expandable to 7.5 MGD
  - 2 observation wells
  - Piping improvements
  - Re-drill 2 existing wells that do not have pumps under existing water rights (3.7 MGD)
- Try to obtain new water rights for a minimum of 3.8 MGD for the South wellfield (this would provide for your future 2.5 MGD expansion)
- Have DWR correct limitation that was placed on Vested SA035 and reiterated in 31636 (Currently 11,837 ac-ft). This will allow the full water right usage of 2,511 ac-ft to be used at South Wellfield (Proposed revised water rights 12,532 ac-ft).
- At a minimum obtain 1.3 MGD and 670 acre-feet of water rights and drill 2 new wells (assume 500 gpm per well). Proposed total water rights 13,202 ac-ft

Capital Improvement Plan Steps
(Continued)

Phase III – bring online by 2025

- Improvements at Downtown Wellfield for an additional 0.5 MGD
  - Re-drill 2 wells

Phase IV – bring online by 2030

- Improvements at Downtown Wellfield for an additional 1.1 MGD
  - Re-drill one well

Phase V – bring online by 2040

- Improvements at South Wellfield for an additional 2.5 MGD
  - If not obtained through previous negotiations, negotiate or purchase an additional 2.5 MGD of water rights and drill 4 new wells (assume 500 gpm per well)
  - Piping improvements

Discussion/Questions

Next

- Commission Meeting
- May 4, 2009